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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/298,372	04/23/1999	SING BING KANG	DEC99-34	1976

7590 07/26/2005

IP Administration
Legal Department, M/S 35
Hewlett-Packard Company
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EXAMINER

YENKE, BRIAN P

ART UNIT PAPER NUMBER

2614

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/298,372

Applicant(s)

KANG ET AL.

Examiner

BRIAN P. YENKE

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on RCE/Amendment 05 July 05/06 June 05.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-6,9-11,14-16,19-21 and 25-51 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-6,9-11,14-16,19-21 and 25-51 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05 July 2005 has been entered.
2. Applicant's arguments filed 06 June 2005 have been fully considered but they are not persuasive.

Applicant's Arguments

- a) Applicant states that Carmeli merely discusses measuring the electro-optical performance representative of illumination uniformity based on evaluating the effect of vignetting on an output signal and not the combination of vignetting effect and off-axis pixel projection and that Stein discusses the use of specialized patterns to recover intrinsic parameters of the camera.
- b) Applicant states that Carmeli discusses an align step which provides sharp focus and corrects for optical magnification so the target is correctly aligned to the lens and camera but does not suggest camera tilt effect.

Examiner's Response

- a) The examiner disagrees. As stated by the applicant each cited prior art reference performs a certain function and the motivation for the combination is stated below in the rejection. Regarding the newly amended "combination" limitation, since Carmeli discloses

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determining the drop off caused by vignetting and off-axis pixel projection, Carmeli also meets the combination (and) limitation.

b) The examiner disagrees if the Carmeli discloses the alignment of an image including sharp focus, correct optical magnification and off-axis pixel projection effect, the examiner requests how one can computer such factors without considering the tilting/angle of the camera.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1,4-6, 9-11,14-16,19-21 and 25-51 rejected under 35 U.S.C. 103(a) as being unpatentable over **Carmeli, US 5,699,440 in view of applicant's admitted prior art and Stein et al., US 6,052,124.**

In considering claims 1, 6, 11, 16, 21, 46 and 50-51

Carmeli, discloses a system which tests the performance of at least one electro-optical test devices, which include a light source, test target, lens and an imaging system. The electro-optical system includes a test generator 19, display 18, lens 13 and calibrated camera 12 (Fig 1a/b). A computer 17 which processes the information from system 11 via digitizer 16 (Fig 1a/b), includes a memory (col 5, line 15-23) where a stored database is located, and also includes analysis unit.

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1) *the claimed digitizing an image of a blank textureless surface having a uniform illumination* is met by digitizer 16 (Fig 1a/b) which digitizes a blank textureless surface as shown in Fig 10a

(col 11, line 11-16)

2) the claimed from the digitized image, determining pixel intensity drop off caused by a vignetting effect and an off-axis pixel projection effect is met where the system test for vignetting and the pixel intensity drop off associated with vignetting, where Fig 10a is an ideal input signal, and Fig 10b is the output signal and the result of vignetting an off-axis pixel projection effect, where the off-axis pixel effect is shown in Fig 9a/b and Fig 11.

However, Carmeli remains silent on recovering intrinsic parameters of the camera, and explicitly calibration of the camera.

Carmeli discloses a system which tests the performance of the system (includes light source, target 14, lens 13 and camera 12) which includes the performances of one or more of the selected devices to the testing device can be either the camera 12, lens 13, target 14 and light source 15, where the other components (non-testing) are high performance pre-calibrated components (col 5, line 12-23). The testing device (e.g. camera) is analyzed by computer 17 which includes an analysis unit for analyzing the performance of the system 11 and in particular of the test device therein. Carmeli, discloses in Fig 10a which shows a uniform light function 43, and the result illustrated in Fig 10b attributed to vignetting, in order to analyze/evaluate the effect of vignetting. Computer 17 computes the performance/calibration of various functions (col 6, line 10-29) where the database of memory (computer 17) stores pre-calibrated data of the devices/components for proper alignment. The analysis unit (of computer 17) analyzes the digitized image to determine performance of the electro-optical component to be representative

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of the system and being equal to the product of component performances of each test device and of each pre-calibrated device to determine:

a) Modular Transfer Function; b) Contrast Transfer Function; c) Grey Level Linearity; d) Illumination Uniformity; e) Geometrical Distortion; d) Signal to Noise Ratio; e) Transient Response; h) Blemishes; i) Blooming and j) Chromaticity.

A device is tested by comparing a distorted image due to aberrations with the test device, with a theoretical ideal image which would be obtained if the test device were replaced by an equivalent high performance device. Carmeli also discloses the parameters which the device might include where the data is an inherent part of the components specification (col 7, line 49-57). Carmeli discloses inherent parameters which include, aspect ratio, focal length and calibration data to name a few (col 7 line 49 to col 8, line 9).

Carmeli, discloses there are various parameters of the pre-calibrated and tested devices (col 7, line 59 to col 8 line 64), where the camera parameters might include the size of the image, type of video signal standard (EIA, CCIR, PAL, NTSC, etc), aspect ratio, type of imager and pixel size, where the lens specification includes the focal length. This data is used in determining the performance of the system. Thus Carmeli, determines the performance of the system and the tested device, based upon the analyzed digitized image and the stored data for the pre-calibrated devices and thus is able to calibrate the camera or selected test device, which was not done in prior art (col 3, line 5-13).

The examiner relies on AAPA (applicant's specification, page 1, line 4-6), which states "One of the most common activities prior to using an imaging device, such as a camera is calibration."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Carmeli which discloses the performance testing of a electro-optical system (which includes light source, target 14, lens 13 and camera 12), with AAPA by also calibrating the tested device/camera before it is used.

Regarding the intrinsic parameters of a camera, the examiner incorporates Stein et al., US 6,052,124 which discloses the camera's intrinsic parameters. Stein discloses in the background that the intrinsic parameters of the camera can be represented by the image's aspect ratio, the skew, principal point, and where focal length (claim 46) is related to the aspect ratio.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify/utilize in Carmeli and AAPA, which discloses a system for testing and calibrating the electro-optical system, with Stein by using the well known intrinsic parameters (focal length, claim 46) of the device (i.e. camera) in calibrating the device/camera, since the intrinsic parameters of a device determine it's performance.

In considering claims 4, 9, 14 and 19, *the claimed wherein the step of computing is dependent on a camera tilt effect* is met where the performance of the system/device is calculated/computed based on the alignment step of the image, Fig 2A.

In considering claim 5, 10, 15, 20 and 25, *the claimed computing parameters of a model by minimizing the difference between the digitized image and the model* is met by computer 17 in which the stored database in the memory which stores pre-calibrated components is analyzed by the analyzer (computer 17) after the image is digitized. The digitized image is produced under control of the software stored in computer 17 (col 6, line 48-50) which selects from the database the corresponding standard pre-calibrated

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components whose physical and optical data are known. Then once the image is formed/digitized, the analyzer is able to determine the resulting performance of a test device or the product of the performances and then displayed (Fig 2a-d).

In considering claim 26, 31, 3641,
the claimed wherein the intrinsic parameter is selected from the group consisting of focal length, principal point, skew and aspect ratio.

As stated above, Carmeli remains silent on the intrinsic parameters of the camera, where AAPA was incorporated so show that calibration of a camera is conventional prior to use. The examiner relied upon Stein et al., US 6,052,124 which discloses the well known intrinsic parameters related to a camera. Stein discloses in the background that the intrinsic parameters of the camera can be represented by the image's aspect ratio, the skew, principal point, and where focal length is related to the aspect ratio.

In considering claims 27, 32, 37 and 42,
the claimed wherein the intrinsic parameter is focal length REFER TO CLAIM 26 ABOVE.

In considering claims 28, 33, 38 and 43,
the claimed wherein the intrinsic parameter is principal point REFER TO CLAIM 26 ABOVE.

In considering claims 29, 34, 39 and 44,
the claimed wherein the intrinsic parameter is skew REFER TO CLAIM 26 ABOVE.

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In considering claims 30, 35, 40 and 45,
the claimed wherein the intrinsic parameter is aspect ratio REFER TO CLAIM 26
ABOVE.

In considering claims 47 and 48,

As stated above, Carmeli did not disclose the intrinsic parameters of the camera (i.e. focal length), however Carmeli does disclose the off-axis pixel projection effect which is shown in Fig 9a/b and Fig 11. The examiner relied upon AAPA to show that cameras are conventionally calibrated prior to use. Also, the examiner incorporated Stein, which disclosed that one of the intrinsic parameters of the camera is focal length.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify/utilize in Carmeli and AAPA, which discloses a system for testing and calibrating the electro-optical system, with Stein by using the well known intrinsic parameters (focal length) of the device, since the pixel intensity is dependent upon the cameras parameters.

In considering claim 49,

See rejection for claim 1 above. Regarding the newly added "in proportion to the fourth power of the cosine of an angle between a light ray and an optical path", is also disclosed by applicant as prior art (page 6, para 5). The examiner has additionally included a reference (US 4,887,123) on the attached PTO-892, which includes the fact that the illumination of a point varies with the fourth power of the cosine of an angle (col 1, line 51-64).

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4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Yenke whose telephone number is (571) 272-7359. The examiner work schedule is Monday-Thursday, 0730-1830 hrs.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, John W. Miller, can be reached at (571)272-7352.

Any response to this action should be mailed to:

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

or faxed to:

(571)273-8300

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703)305-HELP.

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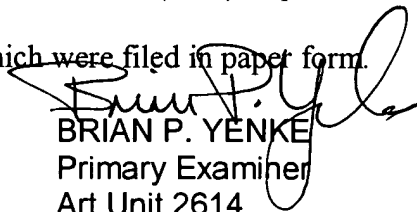
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application status information, as well as to general patent information publicly available. EFS allows customers to electronically file patent application documents securely via the Internet. EFS is a system for submitting new utility patent applications and pre-grant publication submissions in electronic publication-ready form. EFS includes software to help customers prepare submissions in extensible Markup Language (XML) format and to assemble the various parts of the application as an electronic submission package. EFS

also allows the submission of Computer Readable Format (CRF) sequence listings for pending biotechnology patent applications, which were filed in paper form.


BRIAN P. YENKE
Primary Examiner
Art Unit 2614


21 July 2005